Orthagonal Trajectory :-

i)For Cartesian equation

Step 1:- Differentiate given equation w.r.to x.

Step 2:-Eliminate constant by using given equation (if any)

Step 3: put $\frac{dy}{dx} = \frac{dx}{d}$ (Given Diff. Equation).

Step 4: Separate variable .

Step 5: Take Integration (gives orthogonal Trajectory).

ii)Polar Equation :-

Step 1:- Differentiate given equation w.r.to θ.

Step 2:-Eliminate constant by using given equation (if any)

Step 3: put$\frac{dr}{d\theta} = -r^2 \frac{dx}{dy}$ (Given Diff. Equation)

Step 4: Separate variable .

Step 5: Take Integration (gives orthogonal Trajectory).

1) Newton's Law of cooling:-

The temperature of body changes at a rate which is proportional to the difference in temperature between that of surrounding medium and that of the body itself.

$$\frac{dT}{dt} = -k(T - T_0)$$

$T_0 = temperature\ of\ surrounding\ medium$.

T= $temperature$ of body.

t=time at that instant.

After separation variable equation is

$$\frac{dT}{(T-T_0)} = -kdt$$

3)Rectilinear Motion:-Motion of body along a straight line

D'Alembert's Principle:-

Mass X acceleration =Net Forces

i)Velocity(v)= $\frac{dx}{dt}$

ii) Acceleration (a) = $\frac{dv}{dt} = \frac{d^2x}{dt^2}$

Net forces action on a body are:-

1)Weight of the body (mg) *when body is thrown upward then mg is negative=(-mg)

*when body is fall from rest then mg is positive=(+mg)

2)Air resistance or simply resistance:-

*resistance is always negative m x

a=$\pm mg - resistance$ for acceleration:-

i) if acceleration directed towards origin take negative.

ii) Positive if away from origin.

Simple electric circuit

Kirchhoff's law:- The algebraic sum of the voltage drops around any closed circuit is equal to the resultant electromotive force in the circuit.

Sr.no	element	symbol	unit
1	Quantity of electricity	Q	columb
2	Current	I	Ampere(A)
3	Resistance®		Ohm
4	Inductance(L)		Henry(H)
5	Capacitance©		Farad
6	Electromotive force (voltage/battery)		Volt

2) Voltage drop across resistance(R) =Ri

3) Voltage drop across inductance=L $\frac{di}{dt}$

4) Voltage drop across capacitance=$\frac{q}{c}$

Case 1:- Circuit involving L and R along with voltage source E.

$$L\frac{di}{dt} + Ri = E$$

Maximum Value of current I_{max}= $\frac{E}{R}$

Case 2:- Circuit involving R and C along with voltage source E.

$Ri + \frac{q}{c} = E$, where i= $\frac{dq}{dt}$

$$R\frac{dq}{dt} + \frac{q}{c} = E$$

4)Heat flow:-

Fourier's law of Heat conduction :-The rate of area and to the rate of change of temperature with respect to it's distance normal to area.

q= - kA $\frac{dt}{dx}$, where q=Thermal conductivity

A=2∏x , K=constant of thermal conductivity.